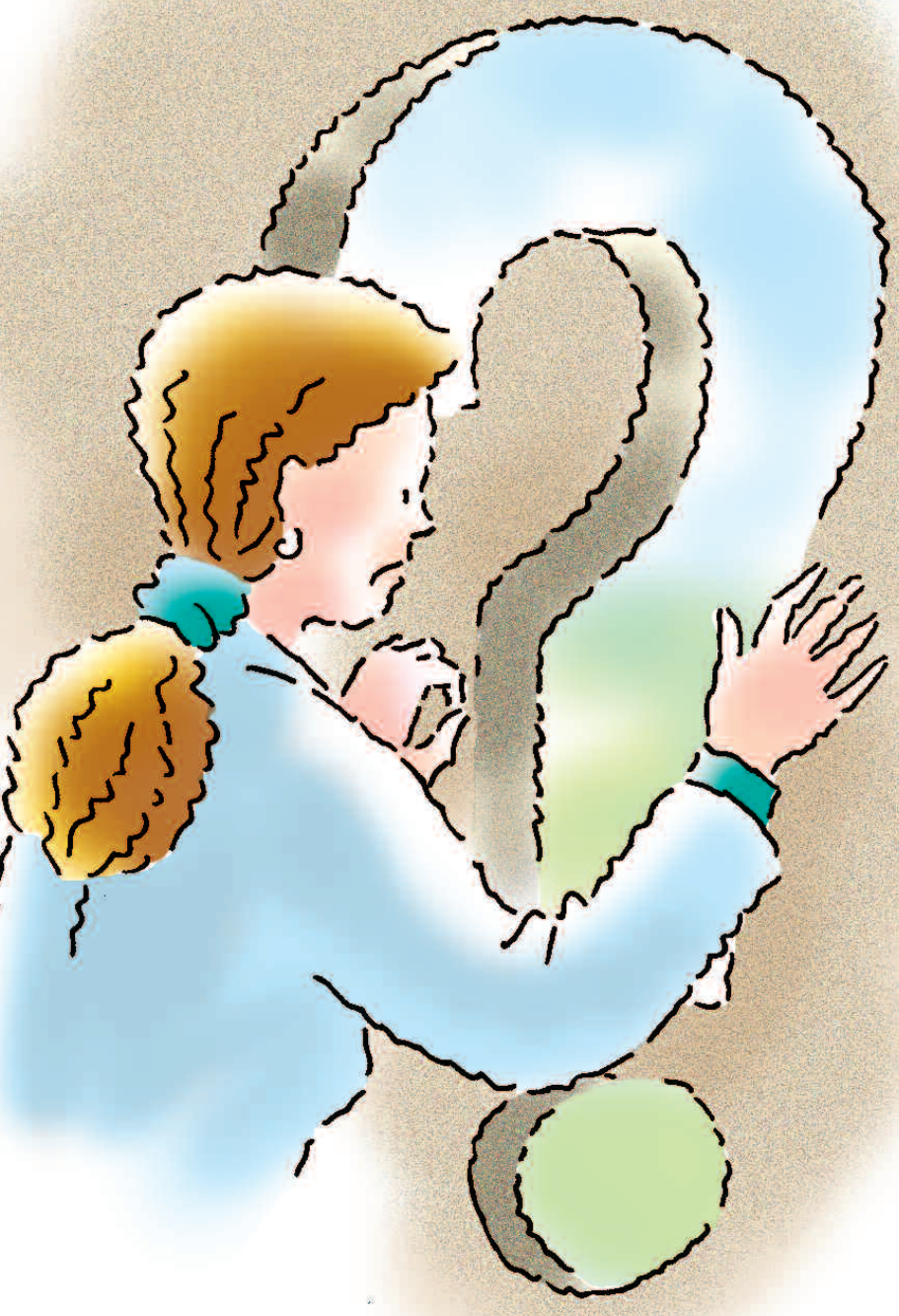
FAQs about SSIs



According to the CDC, surgical site infections, or SSIs, can increase a patient's hospital stay by an average of 7 days—an entire week! What can you do to reduce the incidence of SSIs in your facility? Your questions are answered here.

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PREVENTION OF SURGICAL site infections (SSIs) involves a coordinated effort to implement best-practice guidelines across facility departments during the preoperative, intraoperative, and postoperative periods. The good news? Interventions can be effective.

For this reason, the Institute for Healthcare Improvement includes prevention of SSIs as one of its many initiatives to improve health care across the country. In its how-to guide on preventing SSIs, four care components are identified: appropriate use of prophylactic antibiotics, appropriate hair removal, maintenance of perioperative glucose control, and maintenance of perioperative normothermia. The Joint Commission and the CDC have also instituted safety challenges and goals to reduce the number of health care-acquired infections.

In this article, I'll answer frequently asked questions (FAQs) about SSIs and steps you can take to protect your surgical patient from admission to discharge.

The lowdown on SSIs

What are the most common bacteria that cause SSIs?

The most common bacteria in SSIs are *Staphylococcus*, *Enterococcus*, *Pseudomonas*, and *Streptococcus*. Increasingly, SSIs are being caused by *Escherichia coli*, methicillin-resistant *Staphylococcus aureus*, and *Candida albicans* due to antibiotic resistance. Unusual pathogens, such as *Rhizopus oryzae*, *Clostridium perfringens*, *Rhodococcus bronchialis*, *Nocardia farcinica*, *Legionella pneumophila*, and *Pseudomonas multivorans*, may also cause SSIs.

How does an SSI occur?

The following variables determine whether a surgical wound will become an SSI:

- ***the amount of bacteria that enters the wound area***—either from the air in the OR or the surgical instruments
- ***the amount of bacteria already present in the procedural area***—if the procedure involves an area of the body that's heavily colonized by bacteria, such as the bowel, a large amount of bacteria can enter the wound
- ***the virulence of the bacteria***—the more virulent the bacteria, the more likely an infection will occur
- ***the microenvironment of the wound***—for example, braided suture material can harbor microbes and promote infection
- ***the integrity of the host's defenses***—if the patient is hyperglycemic, hypothermic, or malnourished or if he has a chronic illness, his response to bacterial invasion may be impaired.

Does the type of wound my patient has affect his risk of developing an SSI?

Yes. By knowing your patient's wound class, you can determine whether he's at in-

creased risk for an SSI (see *Classifying wounds*).

Are there different types of SSIs?

Yes. An SSI can be classified according to three definitions:

- ***superficial incisional***—involving only the skin or subcutaneous tissues, this type of infection occurs within 30 days of surgery
- ***deep incisional***—involving the deep soft tissues of the incision, such as the fascia or muscles, this type of infection occurs within 30 days of surgery if no implant is present or up to 1 year after surgery if an implant is involved
- ***organ/space***—involving the organs or spaces opened or manipulated during surgery, this type of infection occurs within 30 days of surgery if no implant is present or up to 1 year after surgery if an implant is involved.

What are the signs and symptoms of an SSI?

Signs and symptoms of a ***superficial incisional SSI*** include:

- purulent drainage, with or without an elevated white blood cell count
- pain or tenderness at the site
- localized swelling, heat, or redness
- a positive wound culture.

Signs and symptoms of a ***deep incisional SSI*** include:

- purulent drainage
- a temperature above 100.4° F (38° C)
- leukocytosis
- localized pain or tenderness

Classifying wounds

Surgical category	Determinants of category	Expected risk of postsurgical infection (%)
Clean	• Nontraumatic site • Uninfected site • No inflammation • No break in aseptic technique • No entry into the respiratory, alimentary, genitourinary (GU), or oropharyngeal tracts	1 to 3
Clean-contaminated	• Entry into the respiratory, alimentary, GU, or oropharyngeal tracts without unusual contamination • Appendectomy • Minor break in aseptic technique • Mechanical drainage	3 to 7
Contaminated	• Open, newly experienced traumatic wounds • Gross spillage from the gastrointestinal tract • Major break in aseptic technique • Entry into the GU or biliary tract when urine or bile is infected	7 to 16
Dirty	• Traumatic wound with delayed repair, devitalized tissue, foreign bodies, or fecal contamination • Acute inflammation and purulent drainage encountered during the procedure	16 to 29

- wound dehiscence
- abscess formation.

Signs and symptoms of an ***organ/space SSI*** include:

- purulent drainage from a drain placed in an organ or space
- a positive culture from fluid or tissue in the organ or space
- a temperature above 100.4° F
- leukocytosis
- pain
- abscess formation or other evidence of infection in the organ or space.

Getting to know you

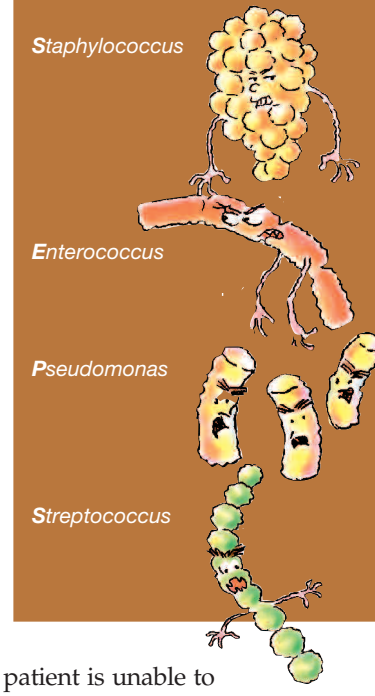
Are there risk factors for SSIs that I should be aware of before my patient undergoes surgery?

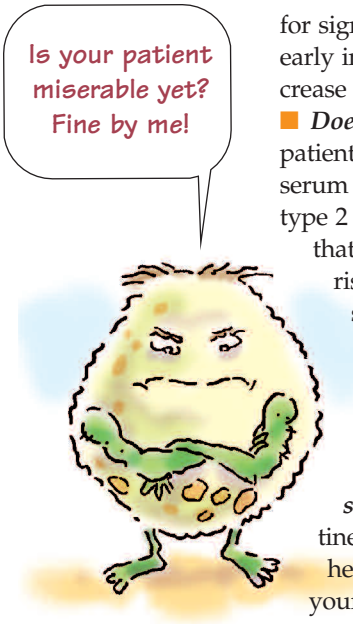
Yes. Every patient should receive pre-op screening for risk factors, including a complete health history and physical exam, medication history, lab workup, and any pertinent diagnostic tests. Ask yourself these questions about your patient upon admission:

- ***Does your patient have a preexisting viral or bacterial infection?*** If the answer is yes, he's at increased risk for an SSI. Sometimes taking an infected patient to surgery is unavoidable; for example, a woman with a urinary tract infection who has a motor vehicle accident and requires emergency surgery. If you have a patient with an infection who must undergo surgery regardless, close post-op monitoring for signs and symptoms of an SSI is key to reducing her risk. If your patient is undergoing routine surgery and has a preexisting infection, it will be treated before the surgery is performed.
- ***Does he have nasal bacterial colonization?*** *S. aureus* colonizes the anterior nares in 20% to 30% of healthy humans. The most frequently found pathogen in SSIs, this bacteria is a strong independent risk factor. If your patient has *S. aureus* colonization of the anterior nares, he may be treated with the topical antibiotic ointment mupirocin before surgery to reduce the risk of post-op SSI; however, more research is needed before this becomes a standard of practice.
- ***Is he getting enough to eat?*** Malnutrition in hospitalized adults is a common problem that can prolong post-op wound healing, increasing the risk of an SSI. The dietitian should identify a patient who's malnourished or who's at risk for becoming so during a pre-op consultation, and develop a plan to ensure adequate post-op nutrient intake for healing. If the patient is unable to orally consume adequate intake postoperatively, then enteral or parenteral nutrition may be considered. If you suspect malnutrition in your patient, look for abnormalities in his serum albumin, prealbumin, serum transferrin, and total lymphocyte levels.
- ***Is he of advancing age?*** With certain types of operations, advancing age does increase the risk of an SSI. For example, one study showed that elderly patients who developed SSIs following orthopedic surgery were at increased risk for death within the first year postoperatively. Another study found that chronic obstructive pulmonary disease, obesity, and wound class were independent predictors of SSIs in elderly patients following cardiothoracic, neurologic, or orthopedic surgery. A third study found that elderly patients with SSIs caused by *S. aureus* had higher mortality rates and longer hospitalizations than those without SSIs. Close post-op monitoring of elderly patients

memory jogger

To remember the types of bacteria most commonly responsible for post-op SSIs, think of **SEPSIS** and drop the **IS.**





for signs and symptoms of SSIs, along with early intervention and treatment, can decrease length of stay, cost, and mortality.

■ ***Does your patient have diabetes?*** Any patient admitted with an elevated fasting serum glucose level should be evaluated for type 2 diabetes before surgery. It's believed that hyperglycemia contributes to the risk of an SSI by impairing phagocytosis, which affects the body's normal defense mechanisms. Maintaining the patient's serum glucose level below 200 mg/dL during and after surgery can prevent an SSI.

■ ***Does he smoke or use other sources of nicotine?*** The use of nicotine has been shown to slow wound healing, increasing the risk of SSIs. If your patient isn't a smoker, be sure to check for other sources of nicotine, such as snuff or nicotine patches or gum.

■ ***Is he immunocompromised?*** Although there's no conclusive data to support a strong link between patients who are immunocompromised and SSIs, monitor patients who are very young or very old because they have decreased immunity and are therefore more susceptible to infection. Patients who regularly take immunosuppressive drugs, such as steroids or organ rejection drugs, are also at risk for developing infection.

■ ***Is your patient obese?*** Obesity is an independent risk factor for SSIs. It can affect the patient's ability to comply with post-op interventions such as ambulation, and it increases stress on adipose tissue, which may lead to suture rupture. Intraoperatively, an obese patient may experience tissue trauma from retraction and longer operating times, increasing the risk of an SSI. And obesity may disturb immune function. If your patient is obese, pre-op antibiotics, thorough skin cleansing, and strict aseptic technique may help reduce his risk of infection, as well as close post-op monitoring of the wound.

■ ***Does your patient have a chronic illness that's poorly controlled?*** Chronic illness may play a role in the development of an SSI if poorly controlled. For example, a patient with hypertension whose blood pressure is under control shouldn't be at increased risk for an SSI, but a patient with diabetes who has chronic hyperglycemia may be at risk. If your patient has an uncontrolled chronic illness, steps should be taken to get the illness under control before surgery is performed.

Definition of SSIs

cheat sheet

Superficial incisional

- Occurs within 30 days of surgery
- Involves only the skin or subcutaneous tissue of the incision
- Has at least one of the following:

—purulent drainage
—organisms isolated from fluid or tissue of the superficial incision
—at least one sign or symptom of infection (pain, tenderness, swelling, redness, or increased temperature)

Deep incisional

- Occurs within 30 days of surgery or within 1 year if an implant is present
- Involves the muscle and fascia of the incision
- Has at least one of the following:

—purulent drainage from the deep incision (without organ/space involvement)
—fascial dehiscence
—identified deep abscess

Organ/space

- Occurs within 30 days of surgery or within 1 year if an implant is present
- Involves anatomic structures opened or manipulated during surgery
- Has at least one of the following:

—purulent drainage from a drain placed in the organ or space
—organisms isolated from fluid or tissue of the organ or space
—identified abscess in the organ or space

Pre-op pointers

Should my patient bathe with an antiseptic at home before surgery?

Your patient should follow his surgeon's recommendations for pre-op skin cleansing; however, the CDC strongly recommends bathing or showering with an antiseptic before surgery as a preventive measure

against SSIs. Requiring several applications, products containing chlorhexidine are most effective in decreasing the microbial count on a patient's skin. Povidone-iodine or triclocarban soaps are also effective.

Should hair be removed from the surgical site?

Shaving the patient preoperatively has been linked to an increased incidence of SSIs. The CDC currently recommends that hair be left on the patient's skin, unless it interferes with the procedure. If hair removal is necessary, use clippers to trim excess hair right before surgery. Don't use a depilatory because of the possibility of hypersensitivity. Also, instruct your patient to refrain from shaving the operative site at home before admission for surgery.

What's the best way to prepare the surgical site?

Chlorhexidine gluconate and povidone-iodine are the most frequently used solutions in the United States. Alcohol is the most effective and rapid-acting skin antiseptic; however, its use in the United States is restricted because of flammability issues. Chlorhexidine is applied in a back-and-forth scrubbing motion; povidone-iodine is applied in concentric circles, beginning at the incision site, to an area large enough to extend the incision or insert drains.

Principles of asepsis

The OR staff adheres to the following principles during a surgical procedure:

- All items used within the sterile field must be sterile.
- Sterile persons may touch only sterile items or areas of the field. Unsterile persons may touch only unsterile items or areas of the field.
- Movement within or around the sterile field must not contaminate the field.
- Sterile gowns are considered sterile in the front, from the shoulder to the tabletop level of the sterile field, and at the sleeves, from the cuff to 2 inches above the elbow.
- Tables are sterile only at tabletop level.
- Edges of a sterile container are considered unsterile once the container has been opened.
- A sterile barrier that has been permeated is considered unsterile.
- All items or areas of doubtful sterility are considered contaminated and unsterile.

Risk factors for SSI

cheat sheet

- Preexisting infection or medical condition
- Nasal bacterial colonization
- Malnutrition
- Advancing age
- Diabetes mellitus
- Nicotine use
- Immunosuppression
- Obesity

Are prophylactic antibiotics appropriate?

Yes. Prophylactic antibiotics can decrease the amount of microbes at the incision site to help prevent an SSI. Depending on the type of surgery being performed, the surgeon may order a single dose of a prophylactic antibiotic. The three core recommendations for prophylactic antibiotic use are:

- choose the antibiotic based on national guidelines
- administer it within 1 hour of the surgical incision (within 2 hours for vancomycin)
- discontinue it within 24 hours of surgery.

The clinician responsible for administering the prophylactic antibiotic varies by institution and may be a nurse or a member of the anesthesia department. Regardless, a mechanism should be in place to ensure that the drug is given in a timely manner.

Intraoperative strategies

Does the intraoperative environment affect the risk of SSIs?

The quality of the OR ventilation system can affect the risk of SSIs. The OR staff should use proper attire and drapes and maintain aseptic technique (see *Principles of asepsis*). They should also keep the OR doors closed to promote positive pressure and limit personnel traffic, ensure environmental surfaces are clean, monitor the qual-

ity of sterilization procedures, and limit the use of flash sterilization.

How important is it to keep the patient warm during surgery?

Mild hypothermia can cause vasoconstriction, decreased delivery of oxygen to the incision site, and impaired function of phagocytic leukocytes, increasing the risk of an SSI. Warming devices should be used to ensure that the patient's temperature remains above 96.8° F (36° C) during the entire perioperative experience. Perioperative nurses should frequently monitor and record the patient's temperature and take appropriate measures to prevent hypothermia.

What about glucose monitoring during surgery?

Physiologic stress caused by surgery can increase blood glucose levels. If your patient has diabetes, his blood glucose level will be monitored intraoperatively and corrective insulin doses will be given if needed.

Post-op wallop

What are some general ways to prevent an SSI after the surgery is performed?

The longer your patient stays in the hospital, the greater his risk of developing an SSI. In general, get him moving as soon as possible to prevent complications caused by immobility and make sure he's receiving adequate nutrition. When he's ready to be discharged, provide the necessary teaching related to his specific surgery to reduce his risk of an SSI at home.

How should I care for the surgical incision?

Protect the surgical wound with a sterile dressing, as ordered, for 24 to 48 hours after surgery or according to your facility's policy. If the dressing must be changed during

Patient teaching for wound care

Teach your patient the following:

Until your sutures are removed

- Keep the wound dry and clean.
- If the wound doesn't have a dressing, ask your health care provider if you can bathe or shower.
- If a dressing or splint is in place, don't remove it unless it's wet or soiled.
- If wet or soiled, change the dressing yourself if you've been taught to do so; otherwise, call your health care provider for guidance.
- Immediately report any signs and symptoms of infection (redness, marked swelling at the incision site, tenderness or increased warmth around the wound, red streaks in the skin near the wound, pus or discharge, foul odor, chills or a temperature higher than 100° F [37.7° C]).
- If soreness or pain causes discomfort, apply a dry, cool pack (containing ice or cold water) or take pain medication as prescribed.
- Swelling after surgery is common. To help reduce swelling, elevate the affected part to the level of your heart.

After your sutures are removed

- Although the wound appears to be healed when sutures are removed, it's still tender and will continue to heal and strengthen for several weeks.
- Follow your health care provider's recommendations regarding the extent of activity.
- Keep the suture line clean. When cleaning it, don't rub vigorously; pat it dry.
- Wound edges may look red and may be slightly raised. This is normal.
- If the site continues to be red, thick, and painful to pressure after 8 weeks, consult your health care provider. (This may be due to excessive collagen formation and should be checked.)

that time, follow CDC guidelines for hand hygiene, decontaminate your hands, and use standard precautions when performing dressing changes.

What should I teach my patient about SSIs?

Before discharge, teach your patient and his family about proper incision care. Teach them to report to the health care provider immediately any signs and symptoms of an SSI, such as purulent drainage, pain, incisional redness or swelling, and an elevated temperature. See *Patient teaching for wound care* for more information.

Stop SSIs in their tracks

An SSI is a major complication for a patient who's undergoing surgery. It increases morbidity and mortality rates, hospital costs, and length of hospital stay. By identifying pre-op risk factors and closely monitoring your patient post-op, you can prevent an SSI and help your patient to a recovery that's complication free. ■

Learn more about it

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